CLAIMS

1) An input system for a compact electronic device comprising a primary sensor and associated interpretive and display-control circuitry, wherein:

   a) the sensor is actuable by a digit of a user and registers values of a planar variable, associated with the digit and modulable by the user, in an x dimension and a y dimension; and also registers values of a normal variable, associated with the digit and modulable by the user, in a z dimension normal to a plane of contact between the sensor and the digit; whereby the set of possible momentary input signals forms a three-dimensional vector region or input space, and the signal registered over an interval of time is a trajectory through this region;

   b) the interpretive circuitry is configured to:

   i) distinguish at least two meaningful ranges of the normal variable, detect transitions between said two ranges, and interpret such transitions in at least one direction as gesture termination signals;

   ii) distinguish multiple target zones within the input space, and test for indication value on a substantially continuous basis, where indication value expresses whether any target zone is indicated and if so which, where a target is indicated if the contemporaneous input value lies within it;

   iii) upon detection of a change in indication value, register the new value and transmit it to the display-control circuitry;

   iv) maintain a mapping identifying assignments of possible generands to target zones;

   v) upon detection of gesture termination, consult the registered indication value to determine whether any target zone is indicated, and if so consult the mapping to determine whether any generand is associated with the indicated target zone, and if so generate it;

   c) the display-control circuitry is configured to:

   i) generate an image which includes a menu comprising an array of menu features;

   ii) maintain a list of associations between particular ones of said menu features and particular ones of said target zones;

   iii) upon receipt of a signal expressing a change in indication value, modify the image in a manner which visually identifies any menu feature associated with an indicated target zone as indicated, and visually identifies all other menu features as not indicated;

whereby tentative selection display is established, and the user is provided with continuous feedback during transits.

2) An input system according to claim 1 which is more specifically a stroke-sensing system, wherein:

  a) the normal variable is force, and the interpretive circuitry is configured to:

    i) identify trajectory segments as gestures in accordance with a parsing rule which distinguishes two meaningful ranges of normal force, one of which is a gesture range and the other of which is a transit range, such that the input space is divided into a gesture zone and a transit zone, and defines entry into the gesture zone as gesture initiation and exit from the gesture zone as gesture termination; whereby gestures are trajectory segments which begin at a point of entry into the gesture zone, remain continuously within the gesture zone, and end at a point of exit from the gesture zone;

    ii) determine selection values for members of a set of menu features and members of a set of possible output signals or generands in accordance with a lexical rule which identifies meaningful features of a gesture and associates code elements with them and a mapping which assigns output values to possible sets of code elements, wherein:

      • the lexical rule defines a set of target zones in input space and associates code elements with them;

      • the interpretive circuitry registers the input signal on a substantially continuous basis, and if on any cycle the input signal lies within a target zone and:

(a) the normal variable is in the transit range, registers the code element associated with the target zone as indicated;

(b) gesture initiation is detected, registers the code element associated with the target zone as selected;

and in either case transmits a signal expressing the registered selection value to the display-control circuitry; and

- the lexical rule further specifies a set of second-element criteria each of which returns a value of true or false when applied to an incomplete gesture and associates a code element with each of these criteria;

- the interpretive circuitry applies the second-element criteria on a substantially continuous basis as a gesture is executed and in the event of a true result registers the code element associated with the fulfilled criterion as indicated and applies the mapping; and if the mapping returns a generand, registers the generand as indicated and transmits a corresponding signal to the display control circuitry; and

iii) upon detection of gesture termination, determine whether a generand is indicated, and if so generate the generand.

b) the display-control circuitry is configured to:

i) generate an image which includes a menu comprising an array of symbols, each of which represents a generand, organized into an array of cells, wherein the cells of the array correspond to possible first code elements and thereby correspond also to target zones, and each symbol is located in the cell associated with the first code element of the pair associated with the generand which the symbol represents;

ii) upon receipt of a signal identifying a first code element as indicated, modify the image in a manner which identifies the associated cell as indicated;

iii) upon receipt of a signal identifying a first code element as selected, modify the image in a manner which identifies the associated cell as selected;

iv) upon receipt of a signal identifying a generand as indicated, modify the image in a manner which identifies the symbol which represents the generand as indicated.

3) An input system according to claim 1 wherein the sensor is mounted to a non-frontal surface of the device, whereby a display which covers substantially all of the frontal surface of the device and which remains unoccluded by the user's hand during use of the device may be provided.

4) An input system according to claim 1 wherein said display-control circuitry is further configured to enable or disable menu display responsive to the value of a user-adjustable setting, whereby display of the menu is made optional and may be toggled on and off by the user.

5) An input system according to claim 1 wherein the sensor is an isometric force-transducing sensor and the planar variable is force.

6) An input system according to claim 1 wherein the sensor is a touchpad and the planar variable is location and the touchpad has tactile features sufficient to generate continuous user awareness of location, whereby the user may reliably execute intended gestures without visual supervision of the actuating digit.

7) An input system according to claim 6 wherein the normal variable is a binary variable whose possible values are contact and non-contact and the gesture-termination signal is termination of contact.

8) An input system according to claim 1 wherein the normal variable is force and each of said meaningful ranges has appreciable depth, whereby

9) An input system according to claim 1 wherein the sensor is an array of discrete keys and the planar variable is location.

10) An input system according to claim 9 wherein the array includes a conventional twelve-key telephone keypad.

11) An input system according to claim 9 wherein the array includes at least one multivalent key which is actuable in a plurality of modes.

12) An input system according to claim 2 in which at least one meaningful gesture has more than two critical points and is associated with a set of code elements which has more than two members.

13) An input system according to claim 1 including logic means which support user-definable mappings, whereby for example gesture remapping and the addition of macros which generate character strings in response to single gestures are made possible.

14) An input system according to claim 1 including logic means which support user-definable lexical rules, whereby for example increased angular resolution, multiple meaningful ranges of vector magnitude, or extended gestures may be implemented.

15) An input system according to claim 1 wherein the sensor is an analog sensor with respect to the planar variable and the system has a cursor-control mode.

16) An input system according to claim 1 with an analog-feedback mode in which a trace representing an input trajectory being contemporaneously generated by the user is displayed on the menu.

17) An input system according to claim 1 wherein a secondary sensor or shift key is provided and is operable by a second digit of the user and serves at least to selectively invoke any of a set of modes including at least a capital-letter mode.

18) An input system according to claim 17 wherein the compact device is a handheld device and the primary sensor is positioned on a back surface of the device and is operable by an index finger of a hand holding the device and the shift key is positioned on a lateral surface of the device and is operable by a thumb of the hand holding the device.

19) An input system according to claim 17 wherein the compact device is a wristwatch with an attached band bearing a buckle and the primary sensor is mounted on an outer surface of the buckle and is operable by an index finger of the user and the shift key is mounted on a lateral surface of the buckle and is operable by a thumb of the user.

20) A stroke-gesture input system for a compact electronic device comprising a sensor capable of registering a three-dimensional input signal generated by a digit of a user and associated interpretive and display-control circuitry, wherein:

   a) the input signal at any moment comprises a value of a planar variable having x and y components and a normal force in a z dimension normal to the plane of contact between the sensor and the digit; whereby the set of possible momentary input signals forms a three-dimensional vector region or input space and the signal registered over an interval of time is a trajectory through this region;

   b) the interpretive circuitry is configured to:

      i) identify trajectory segments as gestures in accordance with a parsing rule which distinguishes two meaningful ranges of the normal force, one of which is a gesture range and the other of which is a transit range, such that the input space is divided into a gesture zone and a transit zone, and defines entry into the gesture zone as gesture initiation and exit from the gesture zone as gesture termination; whereby gestures are trajectory segments which begin at a point of entry into the gesture zone, remain continuously within the gesture zone, and end at a point of exit from the gesture zone;

ii) associate possible output signals or generands with gestures in accordance with a rule which identifies a set of criteria which return values when applied to a gesture and defines a mapping between possible sets of these values and generands;

c) the display-control circuitry is configured to:

i) generate an image which includes a menu comprising an array of menu features;

ii) upon receipt of a signal identifying a menu feature as indicated, modify the image in a manner which identifies the menu feature as indicated.